

THURSDAY, JANUARY 16, 1873

THE INTERNATIONAL METRIC COMMISSION

THE methodical statement of the resolutions passed by the International Metric Commission at their meeting in Paris last October, has already been given in *NATURE*, vol. vi. p. 544. From this statement, a general idea may be formed of the extent and importance of the operations to be carried out under the superintendence and direction of so many eminent men of science, for the construction and verification of new international standards of metric weight and measure. We may thus hope eventually to see a real and practical uniformity established in the weights and measures regulating all transactions of trade and commerce between the several countries of the world, as well as in those used for all constructive works and technical instruments of various descriptions, and in scientific investigations and researches. Such a result of the labours of the Commission will be one of the greatest triumphs of modern civilisation. We may better estimate its value and importance, if we consider that it will create a universal language, so far as regards expressing any required quantity of material things capable of being measured or weighed, and this in terms at once intelligible to every one; and it must afford the means of immensely extending and diffusing useful knowledge, and facilitating its acquirement.

The statement before referred to contains the text of the formal decisions of the Commission upon the several points involved in the immediate duties which have been entrusted to them; that is to say, the construction of the new international metric standards, and the establishment of their identity or their equation by the most perfect instruments and from the most accurate comparisons. In the accomplishment of these objects, all the best appliances of modern science will be employed. It will be seen, also, that the Commission further propose to adopt the most effectual means for maintaining inviolate the uniformity of the new standards of weights and measures, through the agency of an International Metric Institution to be permanently established at Paris. This institution is to be placed under the direction of a permanent committee, which has been already chosen by the Commission from among their own body. Among the members so elected are the chief officers of weights and measures in the principal countries of Europe, and in the United States of North America. To this International Metric Institution it is proposed to entrust the custody of the new prototypes of metric weight and measure, and to furnish to its officers the means, and impose upon them the duty, of making all such further comparisons of the several international standards with the prototypes and with each other as may be required. Regulations are also to be laid down by the Commission for guaranteeing continued uniformity and invariability of these international standards.

But probably many persons in this country will say—Of what use to us will be the making of all these new metric standards, and the creation of this new International Metric Institution? We have our own Imperial

system of weights and measures, as well as national standards, and are quite satisfied with them; why should we want any metric weights and measures? Now, in the first place, without discussing the disputed question of the introduction of the metric system, with its uniform decimal scale, into this country, it may be pointed out that any notion of forcing the extensive adoption of the metric system upon the English people in opposition to public opinion, has been altogether disclaimed by the authorities. In the late annual address to the Royal Society by its president, the Astronomer Royal, printed in the Society's Proceedings on Nov. 30, 1872, he said, with reference to the International Commission for the establishment of new and uniform *Standards* of the Metric System:—"I think it imperative on me to state that the British Government gave their assent only on the express understanding that they could take no part in the Commission if it displayed any propagandist intention. Speaking as the representative of the body who had best considered this subject, namely, the Standards Commission now dormant, I can say as their unanimous opinion that they deprecate the slightest interference with national usages; but they recognise the great importance of an accurate international system which, like the Latin of the Middle Ages, enables men of science to speak the same language; and for this international character they think the metric system singularly well adapted." But, in point of fact, whether we adopt the metric system to a greater or less extent, and sooner or later, in this country, or not, it is quite evident that as it has been adopted by almost every country on the Continent of Europe, and that all the necessary steps have been taken for its adoption in the United States of North America, in Canada, and in British India, thus establishing its international character, it must be of the greatest advantage to us in all commercial transactions with countries abroad, including the computation of Customs duties, to be able to deal with their commodities when weighed or measured, everywhere by one uniform standard. This advantage must, at any rate, be allowed, even if we continue to stick to our imperial weights and measures. In dealing also with technical and scientific instruments, and with computations of quantities in technical and scientific investigations, it must be of great importance to us here in England to find quantities of measure or weight everywhere else expressed in the same terms. These considerations tend to show, even to the upholders of our imperial system of weights and measures, the great benefits that must result to this country from the adoption everywhere abroad of uniform weights and measures; based on standards the identity of which, and its maintenance, will be guaranteed by the International Metric Commission and their permanent institution. They also show how impossible it must be for this great commercial country to remain in a position of isolation with regard to this large international question, and the necessity of our adopting this uniform system of weights and measures, at least for all purposes of an international character.

There are other important advantages proposed to be obtained by establishing the new International Metric Institution, the benefits of which will extend to this country as well as to other countries. Many scientific

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questions connected with the accurate comparisons of Standard weights and measures now require an authoritative decision, with a view to their general adoption. These constitute the data upon which the requisite corrections of the actual results of the several comparisons must be computed, before an accurate determination can be arrived at, with reference to the circumstances under which the comparisons are made. Amongst these questions may be instanced: The determination of the true weight of a given unit of measure of dry atmospheric air; the true weight of a given unit of measure of pure water; the condition of pure water employed in Standard operations, as to its being more or less deprived of or saturated with air; the rate of expansion of air; the rate of expansion of water and of its maximum density; the amount of aqueous moisture in atmospheric air and its influence on the weighing and measuring of Standards; the relative rates of expansion generally of solid, liquid, and æriform bodies, and the limits of temperature within which this rate is to be determined; more particularly, of the relative expansion of the quicksilver and glass of thermometers, and the constancy of the determined rates of expansion; the constancy of the determined length of Standard measuring bars, and of their coefficients of dilatation; the adoption of a uniform average rate of expansion, within determinate limits of temperature, of metallic and other bodies used in Standard operations; and of average conditions of temperature of these bodies and of the medium in which they are placed; the employment of an air thermometer, &c. &c. At the present time, different solutions of these questions are adopted in the several countries, the results being that not only is any uniform agreement in the results of comparisons rendered absolutely impossible, but doubts exist as to the accuracy of the determinations of these questions which have hitherto been made. It is evident that in order to obtain any satisfactory solution, long and varied observations and comparisons will have to be made, and such labours are proposed to form an important part of the future work of the International Metric Institution. It is only by such an authoritative determination made by the combined efforts of men of science in the different countries, under whose direction the Institution is to be placed, that the urgent need of uniform and accurate data for obtaining trustworthy results in all comparisons of Standards can be expected to be supplied.

It ought, however, to be distinctly understood that not only the more immediate operations of the International Metric Commission, but also the proposed future operations of the International Metric Bureau, under the directions of their permanent committee, are wholly and exclusively of a scientific character. The objects of the Commission are to furnish and to afford the means of maintaining uniform standards for all countries which have already adopted, or which may hereafter adopt, the metric system, as either a national or international system of weights and measures. The true sphere of the Commission is thus limited to the investigation and accomplishment of all the best means, either in a scientific or a technical point of view, by which these objects may be attained. Whether the adoption of the metric system of weights and measures by this or any other country be advantageous to it or not is a question to be determined by

each country upon its own merits, but it is one with which the International Metric Commission is no way called upon or entitled to interfere.

An incident which occurred at the late meeting of the Commission may be noticed as showing how strictly their objects were considered by them to be confined to purposes of science. The question of the mode of voting having been raised, it was referred to a committee to report upon. The Committee recommended, and the proposition was unanimously agreed to by the Commission, that on ordinary occasions each member present should vote personally; but upon the demand of five members, the votes should be taken by countries represented, each country having one, two, or three votes, according to the population. Amongst others, one vote was assigned to the Papal See, represented by Padre Secchi, who had originally been appointed delegate of the Papal States. Unfortunately a report of these proceedings appeared in the *Journal Officiel*, though not in the official portion, and attracted the notice of the Italian Parliament then sitting, when the Italian Government was instructed to insist on the cancelling of the vote for a nation given to the representative of the Papal See, the Pope being no longer a territorial Sovereign. A diplomatic communication was accordingly made to the French Government, who declined to interfere in a matter within the power of the International Commission, and which had reference merely to the proceedings of a scientific body. The Italian Government then directed their representatives to take no further part in the Commission, so long as Padre Secchi continued to be the delegate of the Papal See, and Marquis Ricci and Prof. Govi were reluctantly compelled formally to announce this to the Commission. But the Commission felt that they could only deal with this communication as an accomplished fact, and they expressed their great regret at this secession, in consequence of imperative orders, of two of their most eminent colleagues, which they trusted would be only temporary. They at the same time expressed their astonishment at so unlooked-for an interference with their proceedings which were of so entirely a scientific character.

The extent of the preliminary work hitherto accomplished by the Commission may be estimated from the fact of their Minutes of Proceedings during the last four years filling 580 closely printed 12mo. pages. On the occasion of their recent meeting, when the Commission was found to comprehend 50 members, representing 29 of the principal countries of the civilised world, the subjects of the formal resolutions passed by them had been previously arranged for their discussion and deliberation, and were referred by them to eleven different Committees. The Reports of these Committees, which are printed at length in the *Procès-Verbaux* of the Commission, contain the form of the Resolutions under each subject which was proposed for adoption; and, generally speaking, they were unanimously passed by the Commission, with but slight amendments. The grounds of the conclusions arrived at by the several Committees are stated at length in their Reports, and in a future article some of the more important of them of the highest scientific interest will be specified.

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